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**2015 Nutrition Risk  
Standing Review Panel  
Status Review**

**Status Review for:**  
*The Risk of Inadequate Nutrition*

**Comments to the Human Research Program, Chief Scientist**

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2015 Nutrition Risk Standing Review Panel (SRP) Status Review WebEx/teleconference  
Participants:

**SRP Members:**

Bruce Bistrian, M.D., Ph.D. (chair) – Harvard Medical School  
Roger Fielding, Ph.D. – Tufts University  
David Heber, M.D., Ph.D. – University of California, Los Angeles  
Mark Hellerstein, M.D., Ph.D. – University of California, Berkeley  
Gordon Jensen, M.D., Ph.D. – Pennsylvania State University

**NASA Johnson Space Center (JSC):**

Yael Barr, M.D.  
Pete Bauer, M.D.  
David Baumann  
Kerry George  
Linda Loerch, Ph.D.  
Peter Norsk, M.D.  
Stephanne Ploeger  
Mark Shelhamer, Sc.D.  
Susan Steinberg, Ph.D.  
Scott Smith, Ph.D.  
Sara Zwart, Ph.D.

**NASA Headquarters (HQ):**

Bruce Hather, Ph.D.

**NASA Research and Education Support Services (NRESS):**

Tiffin Ross-Shepard

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On November 6, 2015, the Nutrition Risk SRP, participants from the JSC, HQ, and NRESS participated in a WebEx/teleconference. The purpose of the call (as stated in the Statement of Task) was to allow the SRP members to:

1. Receive an update from the HRP Chief Scientist (or designee) on the status of NASA's current and future exploration plans and the impact these will have on the HRP.
2. Receive an update on any changes within the HRP since the 2014 SRP meeting.
3. Receive an update by the Element or Project Scientist(s) since the 2014 SRP meeting.
4. Participate in a discussion with the HRP Chief Scientist (or designee) and the Element regarding possible topics to be addressed at the next SRP meeting

Based on the presentations and the discussion during the WebEx/teleconference, the SRP would like to relay the following information to Dr. Shelhamer, the HRP Chief Scientist.

The SRP thinks the research conducted in support of addressing the Risk of Inadequate Nutrition continues to be extremely productive and important to the successful completion of the closing of gaps in knowledge related to inadequate nutrition in low Earth orbit flights, as well as long duration spaceflight anticipated in the future. Given the major increase in risk related to the proposed exploration of deep space, it is important to facilitate the gathering of as much data as possible in terms of blood and urine sampling and special testing that will foster a major increase in the quality of knowledge gained from a limited data set. Given the ability to define the dietary inflammatory potential of normal food (an important factor in a space environment that is likely to markedly increase oxidative inflammation) as well insulinogenic effects (important in managing fluid retention) of the diet, the SRP thinks it will be important to explore this aspect of mitigation as well to continue their seminal work in the potential visual complications of spaceflight.

The SRP would like to emphasize priority for the following initiatives that Dr. Smith presented during the WebEx/teleconference:

1. The extended genetics study in relation to one carbon metabolism.
2. The biochemical profile study including blood and urine samples. The ability to measure serial blood samples to examine space-induced changes in various serum and urine-based parameters is a critical component of the nutrition research program.
3. Investigations of mitigating radiation exposure /oxidative stress concerns with diet and supplement measures. This is especially critical in view of the anticipated Mars missions and possible adverse impacts upon multiple key body functions.

The SRP would also like to stress the importance of the ongoing research being conducted especially as it relates to the health of the astronauts. The integrated nutrition program using standardized preparations of foods with potential antioxidant activity to protect against radiation injury is important as is the development of specific testing outcomes in regards to the eye, brain, bone, and vital organs. Great progress has been made but additional support for this important work is critical to the success of the future long duration space travel being contemplated.

The HRP's seminal findings about visual complications of spaceflight were primarily enabled by the availability of reliable functional outcome measures, in this case ophthalmologic exam. As

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other important potential nutrition risks are observed, the SRP thinks it will be equally important to make optimal use of functional/physiologic outcome measures in order to anchor both correlational and intervention studies. Reliance of functional outcome measures and establishing a baseline for testing countermeasures appears to be part of HRP's core philosophy and mandate for maximizing limited resources. Newer functional metrics have been developed in recent years and could be of great value for the HRP to incorporate. For example, the observation of increased white brain matter densities is of concern, and might be anchored functionally by new methods for monitoring myelin turnover from blood samples. Similarly, changes in muscle mass, bone catabolism, immunology and chronic inflammation are increasingly amenable to minimally invasive monitoring in ground studies and in spaceflight. Evaluation of emerging technologies and metrics in these areas as outcome markers is worthy of attention.